REMARKS

In the amendments above, Claims 1-29 and 31 have been amended to more particularly point out and distinctly claim Applicants' invention.

Informalities

Claims 1-29 and 31 have been objected to due to informalities. In the amendments above, Applicants have corrected the informalities and respectfully request that the Examiner reconsider and withdraw the objections.

35 U.S.C. § 112 Rejection

The Examiner rejected Claims 26 and 27 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner's attention is directed to the amendments above, where Applicants have amended Claims 26 and 27 to more particularly point out and distinctly claim the invention. Applicants respectfully request the Examiner reconsider and withdraw the rejection under 35 U.S.C. § 112.

35 U.S.C. § 103 Rejection

Claims 1-3, 8, 9, 12, 14-19, 24, 28, 29, and 31 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Hsieh, U.S. Patent No. 6,292,531 ("Hsieh") in view of Francke et al., U.S. Patent Application Publication No. 2003/0174806 ("Francke"). The Examiner maintains that Hsieh teaches the currently claimed invention except for employing compression paddles and that it would have been obvious to one of ordinary skill in the art at the time of the invention to employ compression paddles as breast support, as demonstrated by Francke, and in the mammography method of Hsieh, in order to provide a clearer x-ray image of the breast through the x-ray absorbing fat and

glandular tissues of the breast as suggested by Francke. The Examiner further maintains that it would have been obvious to one of ordinary skill in the art to use an actuator to convert electrical energy from the controller to mechanical energy to move the at least one sensor in the apparatus and method of Hsieh and Francke, since actuators are known to perform such an energy transition for electrical devices with moving parts to provide mechanical force to move said parts from electrical energy.

The Examiner also maintains that it would have been obvious to one of ordinary skill in the art to use an actuator to convert electrical energy from the controllers to mechanical energy to move the collimator in the apparatus and method of Hsieh and Francke since the actuators are known to perform such an energy transition for electrical devices with moving parts to provide mechanical force to move said parts from electrical energy.

Applicants respectfully traverse the above rejections.

Applicants first point out that Hsieh does not disclose a mammography apparatus with compression plates nor does Hsieh discuss such scanning imaging to which the present application is directed. Further, Hsieh discusses 3D imaging, while the current invention and Francke discuss taking 2D images only. The only similarity between Hsieh and the invention claimed herein is that they relate to the digital imaging of breasts.

It is clear that scanning, according to the terms in the present application, means "sweeping" by the beam. On the other hand, Hsieh uses the term scanning in a more general way. According to Hsieh, scanning means "photographing," etc., and the actual exposures take place with a stationary x-ray source/detector. Hsieh teaches that the x-ray source and/or the detector are moved between individual exposures, but not during the individual exposures. In practice, should one be inclined to move either the x-ray source or the detector, or the object, during an exposure, the resulting image when using Hsieh's imaging system would be blurred.

With regard to scanning, the Examiner refers to a paragraph at Column 3, lines 55 et seq., of Hsieh, which paragraph discloses:

> In operation, patient 22 is positioned so that the object of interest is within the field of view of system 10, i.e., at least breast 12 is positioned within plane of interest 24 extending between source 14 and detector 18. The object of interest, breast 12, is then scanned <u>from at least two projection angles</u> and <u>projection data for each projection angle</u> is collected utilizing detector array 18. The collected projection data is then utilized to generate three dimensional cross sectional images for scanned breast 12. More specifically and in one embodiment shown in FIGS. 1 and 2, the x-axis <u>position</u> of x-ray source and x-ray detector 18 are translated in the x-axis position so that <u>plane of interest 24 is at a first projection angle 40. The projection angle of system 10 is then altered by translating the position of at least one of source 14 and detector array 18 so that plane of interest 40 is altered to a second projection angle 42</u> and so that entire breast 12 remains within the field of view of system 10. More specifically, imaging system 10 collects <u>projection data</u> for projection angle 42 by synchronously altering the x-axis position of x-ray source 14 and detector array 18. Particularly, translating x-ray source in a first direction and translating detector array 18 in a second direction, i.e., a direction opposite of the first direction, the plane of interest 24 is altered from first projection angle 40 to second projection angle 42 so that the entire object of interest remains within the field of interest. <u>Source 14 is again enabled and projection data is collected for second projection angle 42. The same procedure is then repeated for any number of subsequent projection angles.</u> (Emphasis added)

As it is clearly taught here, Hsieh takes at least two ("snap shot") 2D images of the object at different projection angles and uses an appropriate image processing means to create a 3D image (to get "depth information" lacking in 2D images). No movement of the x-ray beam is disclosed.

On Column 5, lines 36-41, of Hsieh, it is disclosed that:

> In addition, the field of view of system 10 may be altered by adjusting collimator 508. More specifically and in one embodiment, collimator 508, as known in the art, includes a first adjustable aperture and a second adjustable aperture (not shown) to adjust the field of view of respective beams 512 and 516 to alter the size of respective beam 512 and 516.

Contrary to the Examiner's assertion, Hsieh does not disclose here that the beam would be narrower than the object. Nowhere in Hsieh is it disclosed that the beam is narrower than the breast, not even that the beam would be narrower than the size of the detector. One skilled in the art would understand that to have a beam of the size of the detector, as illustrated in Hsieh's figures, collimation must be adjusted when the respective position of the x-ray source and the detector array is changed.

With regard to moving a sensor in sync with a scanning movement of the beam, Column 3, lines 33-44, of Hsieh, referred to by the Examiner disclose:

> The operation of x-ray source 14 is governed by a control mechanism 28 of imaging system 10. Control mechanism 28 includes an x-ray controller 30 that provides power and timing signals to x-ray source 14 and a major motor controller 32 that controls the respective translation speed and position of source 14 and detector 18. A data acquisition system (DAS) 34 in control mechanism 28 samples digital data from detector 18 for subsequent processing. (Emphasis added)

Hsieh describes, in the above quoted section, a control that directs the x-ray source when to shoot (i.e., when having been moved at a desired position - that is, at a desired "projection angle") and when not to shoot (irradiate the object, i.e., while moving to a subsequent projection angle). In other words, there is no scanning movement of the beam described here, but an operation according to which the x-ray source is "enabled" in static exposure positions only. Again, there just is no scanning movement of the beam in Hsieh.

Further, in none of Figs. 1-5 or 7 of Hsieh does the sensor remain at right angles to the beam when the x-ray source or the sensor are moved to various exposure positions as shown by the arrows in those figures.

In still further contradistinction to how the Examiner has characterized Hsieh, Hsieh does not teach moving the beam across the object to be imaged. To begin with, Hsieh does not teach a beam that would be narrower than the object; there just is no beam

that could "move across the object." Again, as noted, there is no movement of any beam during any exposure according to Hsieh, not even that of a wide one.

With regard to Francke, Francke discloses 2D imaging of the breast. In order to minimize the problems caused by overlapping structures as discussed in Column 1, lines 34-37, of Hsieh, Francke compresses the breast to have thinner tissue through which to shoot the x-ray quanta. The thinner a breast is compressed, the less structures lying on top of each other there are. Hsieh, however, discusses 3D imaging specifically in order to get rid of overlapping-structure problems altogether by the different imaging technique per se. There would be no motivation for one skilled in the art to compress the breast according to the 3D imaging technique described by Hsieh as the invention of Hsieh itself is specifically designed to get rid of the overlap problem. Hsieh discloses several embodiments, yet specifically fails to mention the compression which was most common in the prior art (2D) mammography at the time of his invention. This suggests that he has not considered compression applicable in the context of his imaging technique. It would be illogical to presume that Hsieh would have considered compression of the breast to be applied in the context of his invention as the core of his invention relates to getting rid of this very problem that the compression was aimed to solve in the prior art systems. In other words, Hsieh wanted to get rid of the overlap problem to begin with, meaning that he wanted to get rid of the need to compress the breast.

In summary, basically, Hsieh uses a detector which is (at least) the size of the breast (e.g., 20 x 20 cm) and irradiates the breast (at least twice at different projection angles) by a short x-ray pulse, the size of the beam (a so called cone beam) corresponding to that of the large detector. Image data is read out from the detector only after an exposure. On the other hand, the invention claimed herein uses a narrow beam (fan beam) and a narrow detector and sweeps across the breast using the narrow beam while continuously reading out data from the sensor during the scan (the exposure). No combination of Hsieh and Francke teaches or suggests the subject invention. Applicants

respectfully request that the Examiner reconsider and withdraw the rejection under 35 U.S.C. § 103 and find the claims allowable.

In view of the amendments to the claims made herein and the arguments presented above, it is submitted that the Examiner's rejections have been overcome and should be withdrawn. The application should now be in condition for allowance.

Should any changes to the claims and/or specification be deemed necessary to place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned to discuss the same.

Reconsideration and allowance are respectfully requested.

Respectfully submitted,

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William H. Dippert

By:______________________
William H. Dippert
Reg. No. 26,723

Wolf Block LLP
250 Park Avenue
New York, New York 10177
(212) 986-1116